

may choose, this sort of training will be of primary importance to them—will form indeed the surest foundation for any course of professional training they may afterwards choose to follow.

So far I have been considering only the elementary teaching of biology, devoting special attention to the course I propose to adopt for preparing beginners for the Pass Degree, and with certain additions to the work, for Senior Scholarships. It still remains to say something about the course of study for Honours in the biological sciences.

It is enacted in the regulations of the New Zealand University by what seems to me one of the wisest rules in the calendar,¹ that a candidate for honours in biology must specialise—that is, must choose some special branch of either zoology or botany, and work up that branch as fully as his time and opportunity will allow. He has already, in taking his B.A. degree, proved his general acquaintance with zoology or botany; he now has to show that, of some limited department of one of these sciences, he possesses more than a mere text-book knowledge.

Suppose, for instance, that a student selects the group of fishes as his special subject. It will be my duty to direct him to the more important works on ichthyology in the University and Museum libraries, so that while taking the most recent work on the general subject as his text-book, he may, when desirable, refer to the original sources of information and acquire the habit—most essential for a student of science—of seizing upon the points of real importance in a monograph or *brochure*. While undergoing this course of reading the candidate will dissect as many as possible of the more important New Zealand fishes, making careful notes and drawings of their anatomy, and comparing his results with the statements he finds in books.

But it is further enacted that the candidate for Honours shall send in the results of some original research. In the hypothetical case I have chosen the subject for investigation would most probably be an inquiry into some branch of fish anatomy as far as it could be worked out on New Zealand species—the nervous system, for instance, or the skull, or the digestive organs in one of the groups, or the detailed anatomy of some single species.

It is, I think, from this part of the Honours work that the conscientious student will derive the greatest benefit, and it is in the fostering of research on the part of its members that a university performs its highest duty. Until it assumes that position indeed, it is only a step above the high school, differing from it in degree only, and not in kind. It is only when original work is directly encouraged, and indeed looked upon as the goal of university life rather than the taking of a degree or the gaining of a scholarship—in other words it is only when knowledge is not only communicated, but advanced, that a university takes its true place, not as a mere finishing school, but as a centre of sound learning.

In the case of the advanced student I repeat it is only when his work becomes in some slight degree *original* that he derives the greatest possible benefit from it. "Every man," says Carlyle, "is not only a learner but a doer: he learns with the mind given him what has been; but with the same mind he discovers further; he invents and devises somewhat of his own. Absolutely without originality there is no man." It is impossible to estimate the benefit to a man's whole nature of setting him to puzzle out something that has never been thoroughly worked out before, of putting him upon his mettle to spare no effort in the elucidation of the problem before him, and to "hold it crime to let a truth slip." If a man has anything in him this assuredly will bring it out, more than years of absorbing other men's thoughts and verifying other men's results. The problem he has set himself may seem to others quite insignificant, and its solution a matter of no moment—"the pitifullest infinitesimal fraction of a product"—but to him it is all-important—"an ill-favoured thing, sir, but *mine own*."

This brings me to the last point I have to touch upon. It is to be hoped that a certain proportion of the students who study biology here may be brought to look upon it not as a means of education only, but as a pursuit to be carried on after leaving the University. It is interesting to notice how much scientific work in England has been and is done by what may be called

¹ I am sorry to see that the Senate at its recent meeting has adopted a regulation which cannot fail to lower immeasurably the standard of the Honours examination in biology. It is proposed in fact to make the candidate take up a special subject in both botany and zoology. A student, for instance, whose predilections are zoological, and who may never have studied botany at all, is to make a special study of "some one family of the vegetable kingdom," as well as of some group of animals. The inevitable result will be that one or both subjects will be crammed, and Honours will cease to have their legitimate value, and will become nothing more than a step beyond the Pass Degree.

scientific amateurs, men who, while engaged in professional or business pursuits, devote their spare time to the advancement of some branch of natural knowledge. And I think I am justified in saying that New Zealand has hitherto been pre-eminent among the Colonies for following out in this respect the traditions of the Mother Country. To say nothing of botany, many groups of animals have already been thoroughly well worked up, and considerable headway has been made with others; but "there remaineth yet very much land to be possessed," and one may venture to hope that workers from this University will before long begin to swell the *Transactions* of the New Zealand Institute and the publications of the Geological Survey. Upon any who may have this laudable ambition before them I would venture to urge the advisability—I might almost say necessity—of acquiring a sound and exact, although necessarily elementary knowledge of biology as a whole, before beginning to study any special branch. The work of a man who knows his own limited branch of science, and nothing beyond, is quite sure to be imperfect, and will most probably be evanescent. The highest results are only to be obtained by studying a group or a species, not only in and for itself, but in connection with other groups or species, by keeping always in mind the possible connection of one's own results with those of others, by remembering that the objects one is studying are not isolated things like coins or postage-stamps, but are *organisms*, whose special characters have been impressed upon them by forces which have been at work from the beginning of all things.

Finally, it is just possible that some day one of our students may be brought to take up biology as a career. I need hardly say that such a one, besides completing his studies elsewhere, would be probably compelled, unless possessed of private means, to exercise his profession either in Europe or in America, since there is very little chance at present of more than one biological appointment in a decade falling vacant in this Colony. But a man with a love for his subject and not afraid of hard work, who, after learning all he could learn here, availed himself of the best teaching at home—at London, Cambridge, or Heidelberg—would, I feel convinced, have every chance of success. He would never get rich; the present practical applications of biology are not such as insure fortunes. He would have all his life to be satisfied with an "*aurea mediocritas*" in matters of finance, but he could count upon what is even better than a large income—increasing joy and constant development through a thoroughly congenial life-work.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

OXFORD.—The Colleges meet on Saturday, October 15, and the professorial lectures begin the following week. The professors and lecturers in physics have drawn up the following scheme of lectures and classes for the Michaelmas term:—Prof. Clifton lectures on Wednesday and Saturday on terrestrial magnetism, and Prof. Bartholomew Price lectures on Tuesday, Thursday, and Saturday on the dynamics of material systems. Mr. Hayes lectures on electrostatics (treated mathematically). Instruction in practical physics is given daily in the Clarendon Laboratory, under the direction of Prof. Clifton, Mr. Stocker, and Mr. Heaton. Mr. Stocker gives an experimental lecture on elementary mechanics, and Mr. Heaton has a class for problems in elementary mechanics and physics. The above lectures are given in the University Museum. At Queen's College Mr. Elliot gives a course on geometrical and physical objects; at Christ Church Mr. Baynes gives a course on elementary heat and light; and at Balliol Mr. Dixon gives a course on elementary magnetism and electricity.

On Tuesday the Fellows of Wadham College elected Mr. G. E. Thorley to the wardenship of the College, in place of Dr. Griffiths, resigned. It is understood that Dr. Griffiths will continue to reside at Oxford, and will remain a delegate of the University Press and of the Local Examinations.

An examination for Natural Science Scholarships begins on Thursday, October 13, at Exeter and Trinity Colleges. The scholar elected at Exeter will be expected to read for honours in the biological school, and the scholar elected at Trinity will be expected to read for honours in chemistry or physics.

An election to a Brackenbury Natural Science Scholarship at Balliol College will be held in November. Papers will be set in physics, chemistry, and biology. Candidates may offer themselves in two of these subjects, and may also take mathematics or an English essay.

CAMBRIDGE.—Prof. Paget will lecture on Clinical Medicine at the Hospital this term; and Prof. Latham on the Physiological Actions and Therapeutic Uses of Remedies, at Downing College.

Practical Anatomy commenced at the Dissecting Room on October 5; and demonstrations for second year men on October 7. Prof. Humphry's lectures on the Organs of Digestion begin on October 13. A class in anatomy and physiology, preparatory for the second M.B. and the Natural Sciences Tripos, will meet for the first time on October 17.

Prof. Living lectures this term on the General Principles of Chemistry, and also on Spectroscopic Analysis, taking limited classes at successive hours on the latter subject; there will be both practical observation with spectroscopes, and explanations of principles and results. Prof. Fawcett will lecture three times a week on Physical Chemistry, beginning October 14; and two tutorial lectures weekly will be given in connection with these lectures by Mr. A. Scott, the professor's assistant. Investigations may be carried on in the laboratories, with the approval of the professors. Demonstrations in Volumetric Analysis will be given by one of the demonstrators three times a week.

Mr. F. M. Balfour will give two courses of lectures (elementary and advanced) on Morphology, with practical work, at the New Museums, each course to extend over two terms. Both courses will be on the Invertebrata this term.

Dr. Vines commenced his lectures on the Physiology of Plants at Christ's College on October 12.

Prof. Stuart lectures on Mechanism three times a week; the workshops and drawing office open on October 14. Mechanical drawing and machine designing will be taught in the drawing office; and the use of tools, the elements of practical engineering and the construction of physical instruments in the workshops.

Prof. Lewis has two courses this term, one on Descriptive Crystallography, and the other on the principal minerals known as rock-constituents.

Lord Rayleigh lectures on Electricity and Magnetism; Prof. Cayley on Abel's Theorem and the Theta-functions, the deputy Plumian Professor on Practical Astronomy.

SOCIETIES AND ACADEMIES LONDON

Entomological Society, September 7.—Mr. H. T. Stainton, F.R.S., president, in the chair.—Rev. A. E. Eaton exhibited a dried specimen of the nymph of a species of *Euthyplocia*, a genus of *Ephemeroidea* previously known only in the adult condition.—Mr. E. A. Fitch exhibited a larva of *Zeuzera aculei*, infested with a species of *Encyrtus* in extraordinary numbers; specimens of a fly (*Drosophila cellaris*) bred from a bottle of pickles; a series of interesting galls (*Cecidomyia*), and some stems of *Equisetum* in which larvae of *Dolerus eglandariae* were feeding.—Mr. T. R. Billups exhibited six new British *Ichneumonidae*.—Mr. C. O. Waterhouse exhibited a specimen of the common mouse attacked by the larva of an *Estrus*.—Sir S. S. Saunders exhibited specimens of *Sarcophaga lineata*, Fall., which destroys locusts in the Troad, and of *Chalcis flavipes*, Panz., parasitic on the parasite itself.—The president read a letter from the Colonial Office respecting the report forwarded by the Society on locust parasites.—Mr. C. O. Waterhouse read descriptions of some new *Coleoptera* from Sumatra.—Mr. J. S. Baly communicated descriptions of some new species of *Eumolpidae*; and Mr. A. G. Butler communicated a list of butterflies collected in Chili by Mr. T. Edmonds.

PARIS

Academy of Sciences, October 3.—M. Wurtz in the chair.—M. Dumas communicated the decisions recently come to by the Congress of Electricians on electrical standards. He also exhibited an ingot of steel produced by Dr. Siemens in the Exhibition, by electric fusion (in fourteen minutes) of a few kilogrammes of steel in a magnesia crucible. The expenditure of fuel to drive the machine was less than that required by direct fusion in a common furnace.—On the secular displacements of the planes of orbits of three planets, by M. Tisserand.—Public experiments on vaccination of symptomatic charbon, made at Chaumont (Haute-Marne) on September 26, 1881, by M. Bouley. Symptomatic charbon is proved to be distinct from bacterian charbon; *inter alia*, the microbe of the former, introduced into the veins, insures future immunity, producing at the time only slight fever. This vaccination of MM. Arlong, Cornevin, and Thomas, differs from that of M. Pasteur in that the natural virus is used in all its energy (not attenuated). Care has to be taken not to let the virus enter cellular tissue, but

only the (jugular) vein. The experiments here recorded were made on 25 young cattle, 13 of which had been vaccinated, and the results distinctly vindicate the method. In the second injection the cannula was deeply inserted in muscular tissue.—On a new application of the equation of Lamé, by M. Gylden.—Observations of the comet of 1881 (Encke) and of 1881 (Barnard), made at Paris Observatory, by M. Bigourdan.—Application of radiophony to telegraphy; multiple inverse electric teleradiophone, by M. Mercadier. (This was a sealed packet, deposited May 31.) A continuous current traverses a series of radiophonic selenium receivers and telephones at station A, then the line, then another series at B. Before each receiver a wheel with circle of holes rotates regularly, and the passage of the light rays is blocked at will with a Morse key, giving interruptions of the musical notes in the telephones, corresponding to Morse signals. The wheels are arranged to give different notes, and each listener with a telephone concentrates his thought on a particular note. The system may be applied to lines of great length.—On a new electromagnetic pointer designed for experimental researches, by M. Noel. The author sought a means of estimating very quickly and exactly the physiological duration of tendinous reflex phenomena in muscles. A needle is arranged with a friction-coupling of two hollow cones, one of which, when in contact with its concentric cone, causes the needle to traverse a graduated disk at the rate of once in one second; contact of the other cones stops the needle. The motion is determined by currents in a Hughes differential train, *i.e.* two opposite electromagnets with common armature in equilibrium between. When one current passes through their four coils, the armature is attracted to one magnet, and remains there till an opposite current brings it to the other. These currents flow respectively on applying to the tendon an instrument, which closes the first circuit, and on contraction of the muscle, which opens this circuit and closes the other.—On secondary batteries, by M. Rouse. In one arrangement he uses a palladium plate as negative pole, and lead as positive; the liquid being sulphuric acid solution (one-tenth). Another battery also giving good results is made with sheet-iron, lead, and a solution of sulphate of ammonia (the lead either pure or covered with litharge, or pure oxide or sulphate, or all these mixed). Again, sheet iron, ferro-manganese, and sulphate of ammonia solution.—On a manganese battery, the salts of which are utilised or regenerated, by M. Rouse. Ferro-manganese is substituted for zinc in the Bunsen battery. For weak currents and in apartments, permanganate of potash is used for depolarisation (in other cases nitric acid). The salts produced are sulphate and nitrate of manganese, or sulphate and nitrate of potash. Permanganate of potash, or peroxide of manganese is then obtained by chemical processes.—On levulose, by MM. Jungfleisch and Lefranc.—On an egg of an ancient ostrich, by M. Ballaud. This was from a subterranean columbarium at Gonzaga. He compares its chemical constitution with that of a recent egg. There is more carbonate and phosphate of lime, and less carbonate of magnesia, &c.

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